



NOAA Technical Memorandum NMFS-SEFC- 193

EXECUTIVE SUMMARY OF THE 1986 TEXAS CLOSURE.

BY

Edward F- Klima, Scott Nichols,
John Poffenberger and James M. Nance

U. S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
Anthony J. Calio, Administrator

National Marine Fisheries Service
William E. Evans, Assistant Administrator for Fisheries

MARCH 1987

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Introduction

The Southeast Fisheries Center (SEFC) provides a series of detailed reports that evaluate the Texas closure management option in either December or January to the Gulf of Mexico Fishery Management Council.) This year's series of final reports presented of the Gulf of Mexico Fishery Management Council in January 1987 on the 1986 Texas closure will be the sixth year that the Southeast Fisheries Center has evaluated the Texas closure management measure. This report summarizes the SEFC findings reported to the Gulf of Mexico Fishery Management in January 1987.

Background

The Gulf of Mexico Shrimp Fishery Management Plan (FMP), prepared by the Gulf of Mexico Fishery Management Council and implemented in 1981, regulates the fishing for brown shrimp in the Fishery Conservation Zone (FCZ) off the coast of Texas. This regulation prohibited shrimp fishing in the FCZ for five periods: May 22-July 15, 1981; May 26-July 14, 1982; May 27-July 15, 1983; May 16-July 6, 1984; and May 20-July 8, 1985. In 1986 only the portion of the FCZ from 9 to 15 miles was closed to fishing from 10 May to July 2, 1986. State of Texas regulations, implemented in 1960, prohibited shrimp fishing in the territorial sea off Texas during these same periods, except for the white shrimp fishery inside of 4 fm. Thus, all shrimp fishing for brown shrimp was prohibited during these periods in waters along the Texas coast, except for an incidental (illegal) catch of brown shrimp caught in the white shrimp fishery.

The management objectives of the Texas closure regulation (as specified in the FMP) were to increase the yield of shrimp and eliminate the waste of a valuable resource caused by discarding undersized shrimp caught during the period in their life cycle when they are

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growing rapidly. The objective of the 1960-1980 Texas territorial sea closure was to insure that a substantial portion ($\geq 50\%$) of the shrimp in Gulf waters had reached 65 tails/lb or 112 mm in length by season's opening. Thus, the temporary closure of the offshore fishery from mid-May to mid-July each year should provide larger shrimp to the fishery when fishing is again permitted in mid-July. The monetary benefits of this management regulation result from catching larger, more valuable shrimp, thus increasing the ex-vessel value of the fishery.

Historically, discarding of undersized shrimp resulted from lack of markets and a Texas law prohibiting fishermen from landing shrimp below a certain size. Since this law was enforced based on the percentage of the catch below this size, fishermen would often discard a portion of their catch below the legal size. Therefore, the Texas closure regulation, which was expected to increase the size of shrimp, should help eliminate the need of discarding. The most effective method of eliminating the discarding problem was to delete the application of the law to the Gulf fishery, which the state of Texas did in 1981.

To assist the Gulf Council in evaluating the effectiveness of the Texas closure regulation, the National Marine Fisheries Service was requested to monitor and estimate the effects of the regulation. Data collected specifically for these evaluations were used to describe the fishery and estimate the impact of the regulation. The scientific conclusions of the first five years of the studies were presented to the Council in December 1981, December 1982, January 1984, March 1985 and January 1986. Similar studies were conducted in 1986 and the conclusions from these studies were presented to the GMFC in January 1987,

Methods

The research approach in 1986 was basically similar to that taken in previous years, except we treated the 1986 closure as if the entire FCZ were open. Analysis of pre-closure June data supported this assumption. Therefore, simulation analysis compared this years closure with a complete 200 mile closure. The scientific analyses were based on resource survey and fishery statistical data. Fishery research vessels from federal and state fishery management agencies (SEAMAP surveys) collected data on the populations of shrimp in offshore waters before and during the closure period. These data were used to describe the species, size, and location of shrimp. The data also provided input into a yield-per-recruit model to evaluate the closure effects.

Port agents collected statistics on the catch, effort, and fishing location of shrimp vessels operating in the Gulf of Mexico. These data provided information on the species, size, and location of shrimp, as well as information on the catch rates and fishing tactics of the vessels in the fleet. The data were used as input into cohort-type simulation models to estimate recruitment, fishing mortality, and the effects of the closure on biological yield, ex-vessel prices, and value. Price data, collected by the port agents, were incorporated into the models to evaluate the economic impact of the closure. Special economic and social surveys were conducted in 1986 to evaluate the social and economic impacts of the 1986 Texas Closure.

Conclusions

1. Impacts of the 1985 Combined Closure of the Territorial Sea and FCZ on Yield and Ex-vessel Value

As expected, the combined closures have produced a much larger benefit than the FCZ closure alone. The combined closures for 1985 (May 1985-April 1986) were estimated to have decreased landing in the 67+ size category by 8 million

pounds, and increased landings in all other categories by 12 million pounds. This left a net gain of 4.2 million pounds (5%), and a net gain in ex-vessel value of \$33,5 million (7.8%). The percentage increases have continued to drop since 1981, probably due to increases in inshore fishing in Texas.

2. Recruitment

Recruitment of brown shrimp to Texas offshore waters in 1986 appears to have been lower than in 1985, and significantly lower than in 1981. We predicted the 1986 annual offshore yield to be 25.3 million pounds with a range from 16 to 34 million pounds, which is slightly below the average (long-term) production of 27 million pounds. This prediction was based on data collected from the Galveston Bay bait shrimp fishery during May and early June.

Louisiana Department of Wildlife and Fisheries indicated that brown shrimp recruitment west of the Mississippi River would be higher in 1986 than all other years except 1981. The NMFS forecasted a record annual yield of 50 million pounds for the combined inshore and offshore fishery in areas 13-17.

3. Size Composition of Shrimp during the 1986 Closure

The shrimp population in the closed area averaged a smaller size in 1986 than 1985, in part because the closed area was restricted to 15 miles, so the larger shrimp that predominated in deeper waters were not included in the size composition.

4. Commercial Fishing Results

In 1986, the total Louisiana May-August catch was 37.1 million pounds compared to only 19.1 million pounds in Texas. Recruitment levels were also vastly different between areas

13-17 and 18-21. This difference in recruitment and production set the tone for the summer offshore fishery.

The Texas offshore brown shrimp catch in July and August 1986 was 10.7 million pounds compared to 14.0 in 1985, 15.3 in 1984, 9.8 million pounds in 1983, 13 million pounds in 1982, and 25 million pounds in 1981. Considerable discarding of small shrimp was encountered in 1985 with an estimated 1.1 million pounds being discarded in the first six weeks of the open season. In 1986 only 23,000 pounds of shrimp were discarded. Previous studies have shown that on the average 33% of the total number of shrimp caught between May-August are discarded off the Texas coast. This high rate of discarding was not evident in 1986.

Fishing effort was much greater off Louisiana and was much lower off Texas in 1986 compared to 1985 (Table 1). Much of the effort which is normally expended off Texas in July was diverted to Louisiana because of the perceived higher than normal levels of shrimp abundance off Louisiana. However, in reality the relative levels of offshore abundance off Texas and Louisiana were about equal from June through August. Total production was 2 times greater for Louisiana than Texas for May-August and it was this factor that resulted in the lower fishing effort off Texas.

The average CPUE off Texas for July-August period was 856 pounds/day compared to 918 pounds/day in 1985, 819 pounds/day in 1984, 962 pounds/day in 1983, 922 pounds/day in 1982 and 1,895 pounds/day in 1981. Off Louisiana the average CPUE for the July-August 1986 period was 813 pounds/day, whereas the July-August 1985 period average CPUE was only 625 pounds/day. Thus, during the July-August 1986 period, the Texas and Louisiana offshore brown shrimp CPUE values were almost identical. In all other closure years the CPUE off Texas was at least 2 times greater than off Louisiana.

The July size composition of the 1986 offshore brown shrimp catch in Texas waters was different than other closure years with the average size of about 44 count in 1986, compared to an average count of 40-43 count since 1981.

The Louisiana inshore brown shrimp fishery produced 14.3 million pounds in 1986 compared with 8.8 million pounds in 1985. The inshore catch was predominated by shrimp in the 116-count or larger size categories with an average size of 121-count per pound in May and 116-count per pound in June. The Texas inshore fisheries accounted for approximately 5.1 million pounds of brown shrimp in 1986, 5.4 million pounds in 1985, but 7.1 million pounds in 1984. The inshore catch in 1986 was predominated also by shrimp of 116-count or larger size groups, with the average size count of 107 in May and 96 in June. Unfortunately, over 0.7 million pounds of small shrimp were caught in March and April in Texas bays well before the legal opening of Texas bays in mid-May.

Overall, small shrimp were prevalent throughout the bays in May and June, resulting in small shrimp available to the Texas offshore fishery in July, and 34 count or large size shrimp available in August.

5. Vessel Activity

The ratio of June : August effort in 1986 jumped above pre-closure (1977-1980) levels, indicating that effort that had dropped out in past years because of the closure, re-entered the June offshore fishery this year. The fraction of Gulf-wide effort fishing off Texas in August was at pre-closure levels, as it had been in 1983 and 1984 (but not 1985), suggesting that no additional shift in effort to or away from Texas occurred in August. The interpretation of both these 1986 ratios may be clouded somewhat due to the

early July opening. For the first time, August fell behind July as the month of maximum offshore effort.

Slightly more fishing effort was expended off Louisiana than Texas in July (7.5 vs 6.3 thousand days). This is opposite the trend since 1984 where more fishing effort was expended off Texas than Louisiana in July. Further, less fishing effort was expended off Texas in August 1986 than any other August since the FCZ closure has been in effect.

Home port information indicated that during the June 1 through August 31 period Louisiana vessels predominantly landed in Louisiana and very few Texas vessels landed in Louisiana. Likewise, Texas vessels predominantly caught the majority of shrimp landed in Texas. Louisiana vessels rarely landed in Texas. Over 80% of the offshore landings in Louisiana were caught by Louisiana vessels and between 80-90% of the Texas landings were caught by Texas vessels or boats.

6. Impacts of the 1986 FCZ Closure on CPUE and Yield

Potential increases in harvests of larger shrimp were exchanged for access to offshore waters in May and June. The CPUE ratio (Texas : elsewhere) in July 1986 fell to a level comparable with pre-closure years/ indicating no appreciable build-up in biomass due to the 9-15 mile FCZ closure. The July CPUE off Texas was not only similar to pre-closure years but, for the first time since the closure was also similar to the CPUE off Louisiana. The yield per recruit results indicated that plenty of potential for increased yield existed. The yield per recruit results also showed that opening the FCZ in early July instead of mid-July caused some reduction in pounds (4-10%) and ex-vessel value (15-19%) per recruit from the 9-15 mile closed area. The simulation model for the May 1986-April 1987 period showed a 2.3 million pound increase in

small and medium shrimp, and a projected 2.8 million pound decrease in large shrimp, under the 9-15 mile FCZ closure, compared against a simulated closure to 200 miles. Even with the increase in small and medium shrimp, the loss in large shrimp would result in an overall estimated loss of \$9.2 million to the fishery.

A summary of CPUE ratios, yield per recruit results_a and estimated changes in pounds and dollars for 1981-1986 is presented in Table 3.

7. Net Effects of 1986 Closure

The offshore boundary of the Texas Closure was changed from 200 nautical miles to 15 nautical miles during the closed season in 1986. Landings of brown shrimp were estimated to be about 1.28 million pounds greater during May through August 1986 compared to the brown shrimp landings if the entire FCZ had been closed. Shrimp fishermen were estimated to have made \$140 thousand more during this period in gross revenue because the FCZ was open beyond 15 nautical miles.

Based on fishing patterns in 1985, the estimated operating costs of trips that Texas fishermen would have made to other areas of the Gulf of Mexico during the closed season if the entire FCZ would have been closed was \$119 thousand. Similarly, the estimated operating costs of trips that Louisiana fishermen would have made to grids 18-20 during July through August after the closed season was opened was \$179 thousand. Because the FCZ from 15 nautical miles was open to shrimp fishing_p, these fishing trips were not made and these estimated operating costs can, therefore, be considered savings to Texas and Louisiana fishermen.

The administrative and enforcement costs of the regulation during the May through August period 1986 were estimated at

\$250 thousand. The net effects of the closure, using the estimated operating costs as a savings to the industry, were \$190 thousand (i.e., gross revenue of \$140 thousand, plus cost savings of \$300 thousand, minus administrative and enforcement costs of \$250 thousand).

Preliminary estimates of catches for the remaining eight months indicated that the benefits during May through August came at the expense of increase in catches during the later months. The projected catches for the September through April period indicated that 1.8 million pounds more brown shrimp would have been caught if the entire FCZ would have been closed during the closed season in 1986. If ex-vessel prices remained stable through April 1987, then the Gulf shrimp fisherman were projected to have Post about \$8.9 million in net revenue because the FCZ was opened beyond 15 nautical miles (i.e., increase in gross revenue of \$9.2 less operating costs of \$0.3 million). If administrative and enforcement costs were included, then the net benefit of closing the entire FCZ would have been about \$8.65 million.

8. Social Survey

Fishermen interviewed across the northern Gulf of Mexico displayed different feelings depending on their home port. Fishermen from Florida and Alabama appeared to like the closure. Fishermen from Mississippi and central Louisiana generally had no opinion concerning the closure, whereas fishermen from western and eastern Louisiana and along the upper Texas coast were opposed to a closure. Fishermen from ports along the lower Texas coast were generally in favor of the Texas closure.

Summary

The 1985 Texas Closure regulation using simulation analysis estimated a decrease in landings of 0.3 million pounds and a \$6.1 million increase in ex-vessel value due to the closing of the FCZ from May 20 to July 8, 1985. However, the simulation model for 1985 probably does not adequately simulate fishing patterns of the FCZ area had it been open to fishing. The reason for the poor fit is that our bases of simulating effort is based on late 1970's fishery effort patterns and these patterns are different than effort levels in 1985. On the other hand, the simulation model of the combined closure is not impacted similarly since actual 1985 effort values are used. The combined closure model estimates an increase of 4.2 million pounds and a \$33.5 million increase in ex-vessel values.

The preliminary estimates of the simulation model for May through August 1986 indicate an increase of 1.3 million pounds. The simulation analysis for May 1986-April 1987 showed the partial closure in 1986 resulted in an overall loss of 0.5 million pounds because the fishery caught 2.3 million pounds of small and medium shrimp at the expense of 2.8 million pounds of large shrimp. This projected loss was estimated to be \$9.2 million.

In summary there are several factors which were different between 1985 and 1986. These are as follows:

- 1) Brown shrimp production of shrimp between Texas and Louisiana was vastly different with extremely high levels of production off Louisiana and slightly below average production off Texas.
- 2) Relative abundance levels in June, July and August off Texas and Louisiana were almost identical.
- 3) High catch rates off Texas in July were not experienced. No indication of a buildup of biomass due to the 9-15 mile closure.

- 4) Shrimp caught in July off Texas averaged 44 count. Smaller than in all other closure years except 1985.
- 5) Much of the fishing effort which normally is expended off Texas during the closure period was expended off of Louisiana because of the high production and good catch rates off of Louisiana. Less effort was expended off of Texas than in previous closure years probably because of abundance levels rather than a change in the regulations.
- 6) Average price of shrimp in the 41-50 size count was approximately \$1.00 higher in 1986 than in 1985 and the average price for fuel was \$.40 per gallon in 1986, where it was \$.86 per gallon in 1985.

The goals of the Fishery Management Plan were partially achieved in 1986. Small emigrating brown shrimp were protected and allowed to grow to an average size of 44-count. Discarding was not a problem in 1986 because of the high price received for all sizes of shrimp. However, had the shrimp been protected until July 15, fishermen could have harvested a slightly larger size and experienced a gain in pounds of 4-10% and gain value of 15-19%. Problems were encountered in enforcement of the 15 mile line after mid-June as many vessels were observed violating the closure and fishing illegally inside of the closed area during this time frame. Even though a closure of the FCZ out to 20 nautical miles would protect more than 80% of the shrimp greater than 68 count (112 mm), a total closure of the FCZ would aid enforcement.

Texas Closure Reports

Titles of reports on the Texas closure submitted to the Gulf Council in January 1987.

Impacts of the Texas closure on brown shrimp yields. Find report for 1985. Preliminary report for 1986. Scott Nichols.

Economic impacts of the Texas closure regulation, 1981-1985, John Poffenberger.

Economic impacts of Texas closure regulation 1985 and 1986, John R. Poffenberger.

Review of the 1986 Texas closure for the shrimp fishery off Texas and Louisiana. Edward F. Klima, James M. Nance, Peter F. Sheridan, Neal Baxter, Frank J. Patella and Dennis B. Koi.

Table 1, Summary of commercial catch statistics and resource survey results for the Gulf of Mexico brown shrimp fishery.

July-August brown shrimp catch (millions of pounds), fishing effort (1,000 days) and CPUE (pounds per day).

	1981	1982	1983	1984	1985	1986
Texas Offshore						
Catch	25.0	13.0	9.8	15.3	14.0	10.7
Effort	14.8	15.7	10.3	18.6	15.2	12.5
CPUE	1,895	922	962	819	918	856
Louisiana Offshore						
Catch	10.5	5.1	4.9	6.6	6.1	9.6
Effort	11.9	9.8	11.2	11.2	9.7	11.8
CPUE	863	524	439	587	625	813

May-August brown shrimp catch in millions of pounds

	1981	1982	1983	1984	1985	1986
Texas-Inshore						
Offshore	25.3	13.9	10.5	16.1	14.5	14.0
Total	29.5	18.0	16.4	23.5	19.9	19.1
Louisiana-Inshore						
Offshore	23.1	13.7	8.8	13.6	16.9	22.8
Total	38.3	26.8	20.9	28.5	25.7	37.1

Table 2. Summary of analytical results of the Texas closure shrimp fishery management measure, 1981-1985. Values shown are the statistics used to measure the effects of the closure for the FCZ alone and for the Territorial sea and FCZ combined.

Statistic	Year					
	1981	1982	1983	1984	1985	1986
<u>FCZ Closure Alone</u>						
1. CPUE ratio Texas:elsewhere ^{1/}						
July	2.26	2.06	2.34	1.86	1.74	1.24
August	1.56	1.35	1.40	1.34	0.96	1.10
2. Increase in Y/R at F=1.0 (M=0.15 to 0.28)	+14 to 37%	-10 to +10%	+12 to +33%	+15 to +33%	+14 to +33%	+25 to +41%
3. Change in Gulf-wide Yield						
(May-Aug) (million	+4.0 (5%)	+0.7 (1%)	-0.5 (1%)	-0.6 (1%)	-2.5 (4%)	+1.3 (2%) ^{3/}
(May-Apr) (pounds)	+4.2 (4%)	+1.4 (2%)	+0.4 (1%)	+1.4 (2%)	-0.3 (4%)	-0.5 (-1%) ^{3/}
4. Change in Gulf-wide Value						
(May-Aug) (million	+10.4 (7%)	+5.3 (3%)	+2.1 (2%)	+8.5 (6%)	-5.1 (-1.2 %)	+0.14 (<1%) ^{3/}
(May-Apr) (dollars)	+9.7 (4%)	+6.0 (3%)	+6.7 (3%)	18.7 (9%)	+6.1 (1.4%)	-9.2 (3%) ^{4/}
<u>Combined Closures</u>						
(FCZ and Terr. Sea)						
1. Change in Gulf-wide Yield						
(May-Apr) (million	+9.8 (10%)	+4.9 (7%)	+3.5 (6%)	+5.1 (6%)	+4.2 (5%)	<u>2/</u>
pounds)						
2. Change in Gulf-wide Value						
(May-Apr) (million	+59.5 (25%)	+43.2 (19%)	+31.7 (16%)	+37.4 (18%)	+33.5 (7.8 %)	<u>2/</u>
dollars)						

^{1/}Long-term average CPUE ratios (Texas:elsewhere) for 1960-80 are: July, 1.27; August, 1.06.

^{2/}Data required for estimate not yet available.

^{3/}For 1986, the changes in Gulf-wide yields estimate the effects of reopening the FCZ beyond 15 miles, compared to a closure to 200 miles.

^{4/}Based on current prices.